



The Efficiency of Three Irrigating Solutions after Surgical Removal of Impacted Mandibular Third Molars: A Cross-sectional Study

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ABSTRACT

Aim: The present study was conducted to assess the effect of irrigation with three different irrigants, namely normal saline, chlorhexidine, and povidone iodine on pain, alveolar osteitis, swelling, trismus, infection, and food impaction during surgical removal of impacted mandibular third molar.

Materials and methods: Forty-eight patients, including 26 males and 22 females, fulfilling criteria for inclusion in this study were divided into three groups: group I where irrigant used was normal saline, group II as chlorhexidine, and group III as povidone iodine group.

Results: The pain was significantly more in groups I and III in 24 hours and 7th day as well. Alveolar osteitis was noted in

groups III and I, nil in group II. The facial swelling measured in millimeters on 24 hours and on 7th day was significantly higher in 24 hours in groups I and III than in group II. Trismus was significantly more in group I and group III than in group II (with $p < 0.01$) on 7th day.

Conclusion: It is concluded that chlorhexidine is effective in reducing pain, alveolar osteitis, swelling, and trismus when used as an irrigant following surgical removal of impacted third molar.

Clinical significance: Chlorhexidine as irrigating solution helps in reducing the postoperative consequences after third molar surgery. Further studies are required using large sample size.

Keywords: Chlorhexidine, Mandibular third molar, Normal saline, Povidone iodine.

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INTRODUCTION

The extraction of impacted mandibular third molars is a most common procedure in oral and maxillofacial surgery, and is often trialed by pain, trismus, swelling, infections of the wound, and alveolar osteitis associated with the inflammatory response to surgical trauma as the main factors distressing their daily life.¹ However, alveolar osteitis and postoperative infection are the most common complications associated with the extraction of impacted third molars. Alveolar osteitis affects 25 to 30% of patients.² Other complications include infection of the anterior isthmus of the fauces characterized by obvious difficulty in opening the mouth (less than one finger's width), swelling, tenderness on the anteromedial area

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of mandibular angle, pharyngeal pain, and difficulty in swallowing.^{3,4}

The rationale for present study is that during surgical removal of the third molar, irrigation done with irrigants does not only avert injury to the bone but also irrigates the working field and improves the vision of the dentist. In previous animal studies, it was shown that cutting the bone without water spray had significantly created a greater width and amount of inflammatory exudates and cellular debris at the margins of the defect as compared with those with irrigation when observed under the microscope.⁵

The normal saline is most commonly recommended as the best cleansing solution for human body wound.^{6,7} The chlorhexidine is an antiseptic effective against bacteria in different intraoral procedures,^{5,6,8} whereas the povidone iodine is proved to be broad spectrum microbial agent.⁸

The purpose of the present study is to compare the effectiveness of normal saline, povidone iodine, and chlorhexidine irrigating solutions on pain, alveolar osteitis, swelling, trismus, infection, and food impaction after surgical removal of lower wisdom teeth.

MATERIALS AND METHODS

The study involved 48 patients, including 26 males and 22 females, requiring the surgical extraction of mandibular third molar. Patients' age ranged from 24 to 31 years with a mean age of 24.5 years. The ethical approval was obtained from the local ethical committee at Dr. Hedgewar Smruti Rugna Seva Mandal Dental College & Hospital, Hingoli, prior to the study (HSRSMDC/2017/No.023). The study was conducted in the Department of Oral and Maxillofacial Surgery during the period from June 2017 to September 2017 at Dr. Hedgewar Smruti Rugna Seva Mandal Dental College & Hospital, Hingoli, Maharashtra, India. The samples were patients with indication for surgical removal of impacted mandibular third molar. Every patient was subjected to an initial screening and radiologic examination (orthopantomogram), and then to sign a written informed consent to undergo surgical removal of the impacted tooth, and follow-up after surgery.

Study Design

Inclusion criteria were: (1) healthy patients without any systemic disorder, (2) patients with impacted mandibular third molars indicated for surgical removal on either side of the jaw (extraction was done for one side only), (3) presence of the adjacent tooth (37 or 47) in all cases, and (4) no antibiotic or anti-inflammatory medication taken at least 7 days prior to surgery.

Each tooth to be extracted either on right or left side was given a difficulty score according to Freudlsperger

et al.⁹ The angulation of the tooth to be extracted was mesioangular with depth of impaction as occlusal plane of impacted tooth between occlusal plane and cervical line of second molar. Patients were excluded from this study if they: (1) previously had radiotherapy to the head and neck, (2) had organ transplant, (3) were diabetic, smokers, pregnant, lactating mother, allergic to chlorhexidine or povidone iodine, or taking bisphosphonates or steroids, All patients were treated with the same surgical technique. The irrigating solution was delivered as continuous stream during the surgery via low speed handpiece.

Participants

The 48 patients were randomly divided into three groups (n = 16). The irrigants used in these groups were normal saline in group I, chlorhexidine gluconate 0.12% (Cadila Pharmaceuticals Ltd, Argentina) in group II, and 0.5% povidone iodine (Shreeji Pharma International, India) in group III.

Extraction Protocol

All the extractions were carried out under local anesthesia and under aseptic precautions. All patients had local anesthesia with 2% lidocaine and 1:80,000 adrenaline (Lignospan®, Septodont). The surgery to remove lower third molar tailed the standardized technique. An L-shaped incision was made, a mucoperiosteal flap was raised, and bone removal was done with an SS bur under abundant irrigation of normal saline, 0.02% chlorhexidine, or 0.5% povidone iodine as per the assigned group. The flaps were closed primarily with 3/0 plain gut absorbable suture (PG305, Dynek).

Patients were prescribed oral antibiotic (Amoxiclav 625 mg) twice a day, oral analgesic (paracetamol 500 mg) two tablets every 4 to 6 hours as needed, and antacid (Rantac 150 mg) twice a day for a maximum of 7 days. The follow-up was done after 24 hours and on day 7. All the patients were provided with a visual analog scale (VAS) data sheet with a score of 1 to 5 (0, no pain to 5, tolerable very severe pain) for pain and asked to record the score on 7 consecutive days.¹⁰ During their appointment at the clinic on the 7th postoperative day, the independent observer reviewed the postoperative course, examined the extraction site for the presence of alveolar osteitis, pain, food impaction, acute infection, and assessed the degree of trismus and facial swelling. To evaluate the swelling a single examiner performed all clinical measurements prior to surgery (baseline) and after 24 hours and 7th day postoperatively. A 2-0 nylon thread and a millimeter ruler were used to take the facial measurements. Markings with a permanent marker pen were

made before extraction of the mandibular third molar on the angle of the mandible, the soft pogonion, the tragus, and outer corner of the mouth.¹¹ The single value was calculated for every patient, making sum of three values (a) distance (mm) between tragus and outer corner of the mouth; (b) distance (mm) between lateral corner of the eye and angle of the mandible and (c) distance (mm) between tragus and soft facial pogonion.¹¹ Difference between the measurements taken postoperatively after 24 hours and on 7th day and the baseline value was regarded as the swelling of that day.

Statistical Analysis

For the assessment of the pain, VAS score was used (VAS values 0: no pain, 1: mild pain, 2: moderate pain, 3: severe pain, 4: tolerable severe pain, 5: tolerable very severe pain). Wilcoxon signed-rank test was carried out for evaluation of pain. To control for the differences between groups in baseline values, differences between the baseline and the two follow-up values for the outcome

variables were considered for statistical analysis. The analysis of variance (ANOVA) test was carried out the test the difference between groups and within groups.

RESULTS

A total of 48 patients with a mean age 24.5 years were included in the study. All patients had mandibular impacted third molars indicated for extraction due to recurrent pericoronitis or untreatable pulpal and/or periapical pathology. The outcome variables are noted in Table 1 and Flow Chart 1. The alveolar osteitis was noted in groups III and I, nil in group II. The ANOVA test was done to test the difference between groups and within groups listed in Table 2. There was a statistically significant difference ($p < 0.01$). Wilcoxon signed-ranks test was carried out for the evaluation of pain. The pain was significantly more in groups I and III in 24 hours and the 7th day as well. The facial swelling was measured in millimeters on 24 hours and on the 7th day; it was noted that the facial swelling was significantly higher

Table 1: The study parameters

Parameters	Group I	Group II	Group III	p-value
No. of cases of alveolar osteitis day 7	6	0	7	<0.01*
Mean pain score	24 hours	10	06	<0.01*
	Day 7	4	1	<0.01*
Mean facial swelling (mm)	24 hours	10	7	<0.01*
	Day 7	4	2	1.1
Mean trismus (mm) day 7	7	3	8	<0.01*
No. of cases of infection day 7	2	1	3	1.2
Mean score food impaction day 7	9	6	6	0.9

*Significant

Flow Chart 1: Participants with the demographic data

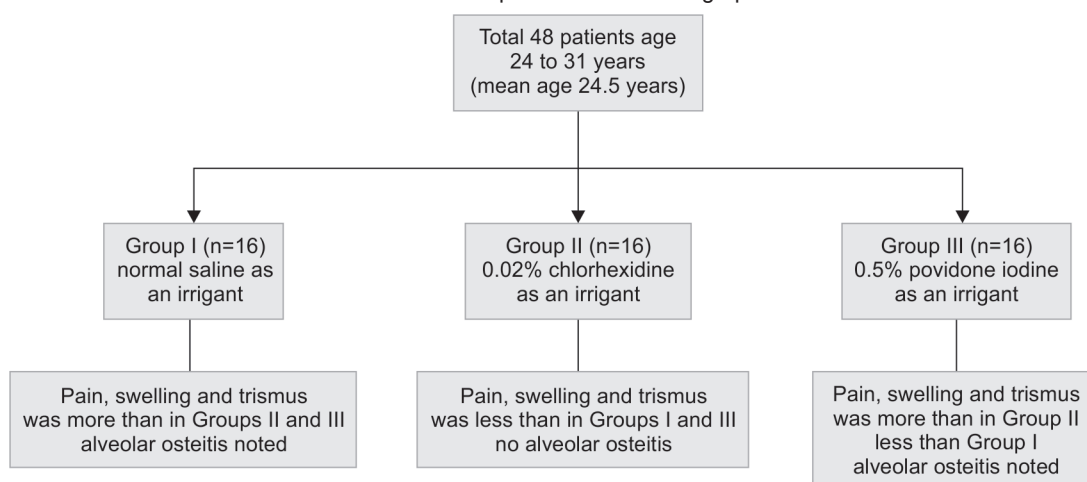


Table 2: Analysis of variance for the postoperative alveolar osteitis

		df	Sum of squares	Mean square	p-value
Between the groups	Day 7	5	0.20	0.10	0.01*
Within the groups	Day 7	43	77.76	3.70	0.97
Total	Day 7	48	77.96		

*Significant

in 24 hours in groups I and III than in group II. The trismus was significantly more in groups I and III than in group II ($p < 0.01$) on the 7th day. There was no statistically significant difference noted in swelling, infection and food impaction on the 7th day ($p > 0.01$).

DISCUSSION

This study was designed to evaluate the efficacy of normal saline, povidone iodine, and chlorhexidine as irrigating solutions on impacted mandibular third molar surgery. An ideal irrigating solution for surgical removal of wisdom tooth should be easily available or prepared, isotonic, nonirritant, nontoxic, nonhemolytic, antiseptic, and yet economical.⁸

Normal saline is isotonic and had physiologic properties similar to the natural tissue fluid. It is the most commonly used irrigating solution for the surgical removal of impacted third molars. During the surgical removal of impacted third molar, normal saline is most commonly used for irrigation and it is recommended as the best cleansing solution for human body wound.^{6,7} In another study conducted by Koerner,¹ it is found that sterile water and normal saline can be used as the irrigating solution during surgical removal of wisdom tooth.

Chlorhexidine is recognized as antiseptic and has been revealed to be safe and effective against both gram-positive and gram-negative bacteria in different intraoral procedures.^{5,6,8} Moreover, chlorhexidine acts quickly and its action is not exaggerated by the presence of body fluids, such as blood.¹² In addition, chlorhexidine has the advantage of residual effect over 48 hours, providing longer duration of action.¹² Further, it is stated that both these irrigants are sterile, reduce heat, and keep surgical field clean. In another study done by Urvi et al,⁸ it is stated that chlorhexidine was found to be more effective in control of postoperative pain and alveolar osteitis than povidone iodine when used for irrigation during the surgical removal of lower third molars.

Povidone iodine is a soluble complex of iodine which releases free iodine slowly. It acts by iodinating and oxidizing the microbial protoplasm.¹³ Iodine is a quickly acting, broad-spectrum microbial agent active against bacteria, fungi, and viruses. When 1% povidone iodine is used as an irrigant in minor oral surgical procedure preoperatively, it is effective in reducing the oral cavity bacterial counts up to 1 hour of the surgical procedures without any local postoperative complications.¹³

The VAS score is one of the most commonly used tools to assess pain intensity and has been shown to be an effective and consistent method of assessing distinct pain as well as being a simple, subtle, reproducible, and universally accepted method of assessing pain.

In the present study, it was found that the 0.12% chlorhexidine was more effective than normal saline and 0.5% povidone iodine in control of pain, swelling, trismus, and alveolar osteitis after surgical removal of impacted mandibular third molar with statistically significant difference ($p < 0.01$). Pain was more in normal saline and povidone iodine groups than in the chlorhexidine group with a statistically significant difference. Urvi et al⁸ stated that the chlorhexidine was found more effective in control of postoperative pain and alveolar osteitis than povidone iodine when used for irrigation during the surgical removal of lower third molars. Yengopal and Mickenautsch¹⁴ stated that the alveolar osteitis was significantly reduced with the use of chlorhexidine. These findings are in accordance with the present study.

Cho et al¹⁵ stated that amount of trismus at the 7th day review was low. Also the maximum subjective scores for trismus, which were recorded 48 hours after operation, had improved by day 7, and these findings are in accordance with the present study.

In this study, 0.12% chlorhexidine was found to be more effective than normal saline and 0.5% povidone iodine in control of postoperative pain, swelling, trismus, and alveolar osteitis following the removal of impacted mandibular third molars. There is no significant difference regarding infection and food impaction on the 7th day ($p > 0.01$). Further studies are needed to evaluate effect of chlorhexidine in the healing process of wound following surgical removal of third molar.

Limitations

Diabetic and immunocompromised patients and those who had organ transplants were excluded from the present study. Therefore, further study is needed in such patients to evaluate the effect of these irrigants on pain, alveolar osteitis, swelling, trismus, food impaction, and inflammation.

CONCLUSION

This study concludes that chlorhexidine is effective in reducing pain, alveolar osteitis, swelling, and trismus when used as an irrigant following surgical removal of impacted third molar.

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